

REMARKS

The courteous interview granted to the applicants' undersigned attorney of record on February 9, 2005 is hereby acknowledged with appreciation. At the interview, the invention, the outstanding official action and the prior art of record were thoroughly discussed.

Entry of the foregoing amendments after final rejection as narrowing the issues and presenting the claims in condition for allowance is respectfully solicited. The foregoing amendments after final rejection are being presented for the first time as a result of an agreement with the examiner.

Claims 1-6 and 8-11 are pending and at issue in the application with claim 1 being the independent claim. Reconsideration and withdrawal of the rejections in view of the remarks below is respectfully requested.

Each of claims 1-6 and 8-11 recites a semiconductor power module that includes a heat sink comprising a compound of at least one of Al₂O₃, AlN and BeO. The heat sink directly contacts a lead frame and includes an electrical insulating property and thermal conductivity.

APPlicants' INTERVIEW SUMMARY

On February 9, 2005, the applicants' representatives, Richard H. Anderson (Reg. No. 26,526) and Aaron M. Peters (Registration No. 48,801), conducted a personal interview with Examiner DiLinh P. Nguyen during which claims 1 and 11, the outstanding official action and the prior art of record were thoroughly discussed. The applicants thank the examiner for her comments during the personal interview. During that interview, Examiner Nguyen indicated that claim 1 would be considered if amended in the manner provided above in an after final amendment. Although agreement was not reached with regard to the claims, the examiner indicated that the above amendments would be entered and subject to a further search and consideration.

Turning to the official action, claims 1-2, 4, 10 and 11 were rejected as unpatentable over Mehr (U.S. Pat. No. 5,530,295) in view of Ohno et al. (U.S. Pat. No. 5,227,662). Claims 3 and 5 were rejected as unpatentable over these references further in view of Majumdar et al. (U.S. Pat. 5,703,399). Claim 6 was rejected as unpatentable over Mehr and Ohno et al. further in view of McCarthy et al. (U.S. Pat. 3,956,726). Claim 8 was rejected as unpatentable over Mehr and Ohno et al. further in view of Tomita et al. (U.S. Pat. No. 5,440,169). Claim 9 was rejected as unpatentable over Mehr, Ohno et al. and Tomita et al. further in view of Majumdar et al. The applicants respectfully traverse the rejections.

As discussed during the interview, the applicants submit that claim 1 is not obvious over Mehr in view of Ohno et al. The action does not establish a *prima facie* case of obviousness because Ohno et al. teaches away from the combination, does not recognize the advantages of using a heat sink made of AlN in direct contact with a lead frame, and demonstrates no reasonable expectation of success in using an AlN heat sink in direct contact with a lead frame.

The action notes the deficiencies of Mehr for failing to disclose a heat sink having an electrically insulating property. (See Action, p. 2) Although Ohno et al. includes a heat sink (40) that may be made of AlN, Ohno et al. nonetheless teaches away from claim 1 by stating that an insulating adhesive tape (16) bonds a pad (i.e., heat sink) to the lead frame (10). The bonding means (16) provides electrical insulation between the pad (i.e., heat sink) and the

lead frame (10). (See Ohno et al., col. 2, ll. 51-65; Figs. 4, 6 and 7) Ohno et al. therefore suggests that the heat sink (14, 32, 40) alone is not effective for electrical insulation and should not be in direct contact with the lead frame (10), despite the fact that AlN may be selected as the material for the heat sink (40). One of ordinary skill in the art would therefore not be motivated by Ohno et al. to provide a heat sink directly contacting a lead frame where the heat sink includes Al₂O₃, AlN and/or BeO as recited by claim 1, because Ohno et al. teaches away from a combination that includes a heat sink directly contacting a lead frame, as recited in claim 1.

Further, Ohno et al. teaches away from the device of Mehr. Mehr discloses a heat sink (22) pressed against a lead frame (18). The heat sink (22) is made of a thermally conductive material such as nickel plated copper or anodized aluminum. (Mehr, col. 2, ll. 37-47) As discussed above, Ohno et al. discloses an AlN heat sink (14, 32, 40) that is separated from the lead frame (10) by an electrically insulating bonding means (16) to provide electrical insulation between the heat sink (14, 32, 40) and the lead frame (10). (Ohno et al., col. 2, ll. 51-65; Figs. 4, 6 and 7) Ohno et al. thereby teaches away from a heat sink that contacts a lead frame, as disclosed by Mehr. One of ordinary skill in the art would therefore not be motivated to combine the electronic package (10) of Mehr with the heat sink (40) of Ohno et al.

Additionally, Ohno et al. does not recognize the advantages of using a heat sink made of AlN in direct contact with a lead frame. As discussed above, the heat sink (40) of Ohno et al. may be made of AlN. However, the heat sink (14, 32, 40) is separated from the lead frame (10) by an electrically insulating bonding means (16) to provide electrical insulation between the heat sink (14, 32, 40) and the lead frame (10). As such, Ohno et al. does not recognize the advantage of increased heat dissipation and electrical insulation associated with an AlN heat sink in direct contact with a lead frame as recited in claim 1.

Furthermore, Ohno et al. demonstrates that there is no reasonable expectation of success in using an AlN heat sink in direct contact with a lead frame. As discussed above, Ohno et al. discloses that a heat sink (14, 32, 40) made from AlN still requires an electrically insulating bonding means (16) to provide electrical insulation between the heat sink (14, 32,

Appl. No. 09/677,558
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40) and the lead frame (10). As a result, Ohno et al. demonstrates that there was no reasonable expectation of success in having an AlN heat sink in direct contact with a lead frame as recited in claim 1.

The rejections of claim 1 and claims 2-6 and 8-11 dependent thereon are therefore improper because the references teach away from claim 1 and from each other, and cannot be combined. A *prima facie* case of obviousness cannot be established where the references teach away from their combination. See MPEP 2145(X)(D)(2). Further, a *prima facie* case of obviousness cannot be established where the prior art shows there is no reasonable expectation of success. See MPEP 2143.02.

CONCLUSION

Accordingly, the applicants respectfully submit that all pending claims are patentable over the art of record and should be allowed. In the light of the foregoing, prompt issuance of a notice of allowance is respectfully solicited.

Should the examiner have any questions, she is respectfully invited to telephone the undersigned.

Respectfully submitted,

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